

**Loughrea GWB: Summary of Initial Characterisation.**

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km <sup>2</sup> )
29  Galway Co. Co.	<b>Rivers:</b> Raford, Craughwell / Dooyertha, Ballymabilla, Toberdoney, Clarinbridge, Kilcolgan. <b>Streams:</b> Carra. <b>Lakes:</b> Loughrea, Esker, Peter's.	Monivea Bog (000311), Raford River Bog (000321), Loughrea (000304) (O'Riain, 2004).	264
<b>Topography</b>	The GWB occupies the area between Loughrea and Attymon. The northern, eastern and southern boundaries are surface water catchment divides, which includes the catchment divide between the Shannon and the Western RBD areas. The western boundary is the boundary with the Dinantian Pure Bedded Limestones of the Clarinbridge GWB. Along the eastern boundary, there is a 1-3 km wide strip where the elevations range from 120-90 mAOD, with the land surface sloping relatively steeply to the west. The remainder of the land surface is characterised by relatively flat ground sloping gently to the west, with elevations ranging from 90-50 mAOD. Surface drainage is to the west.		
	<b>Geology and Aquifers</b>	<b>Aquifer categories</b>	<b>LI:</b> Locally important aquifer which is moderately productive only in local zones
<b>Main aquifer lithologies</b>		The GWB is dominated by the Dinantian Upper Impure Limestones, commonly known as the "Calp" limestone. In the south there are Dinantian Lower Impure Limestones and Dinantian Pure Unbedded Limestones. See Table 1 for a list of rock units in the GWB.	
<b>Key structures</b>		Faults trending NE-SW are mapped in the southern part of the GWB. The beds dip 5-30° to the southwest, southeast and south.	
<b>Key properties</b>		Aquifer properties of the Dinantian Upper Impure Limestones vary across Ireland influenced by lithological variations and variations in the extent of deformation. In this area, the transmissivity of the Dinantian Upper Impure Limestones is expected to be low, typically in the range 2-20 m <sup>2</sup> /d. Transmissivity may be higher closer to faults. The data are distributed amongst all the yield categories: five "Good", four "Poor", one "Excellent" and one "Moderate". There are also records of "failed" wells. Transmissivities are expected to be similar to the Dinantian Upper Impure Limestones. Storativity is expected to be less than 1%. In general, there is poor development of karstification in the Dinantian Upper Impure Limestones. Karst features are recorded in the vicinity of Killreekill and Killullagh, comprising four swallow holes and one turlough. There are no karst features recorded for the other rock units. Water levels generally range from 0-10 m below ground. The data are inadequate to calculate groundwater gradients, but these are expected to be greater than 0.005.	
<b>Thickness</b>		Most groundwater flux is likely to be in the uppermost part of the aquifer; comprising a broken and weathered zone typically less than 3 m thick; a zone of interconnected fissuring 10-15 m thick; and a zone of isolated poorly connected fissuring typically less than 150 m. Water strikes have been recorded up to 50 m below ground in one well in the GWB, but yields are low.	
<b>Overlying Strata</b>	<b>Lithologies</b>	Limestone Till and Cutover Peat dominate the GWB. Much of the till over the central, south and eastern parts of the GWB are described as "Clayey". Toward the western boundary it is described as "sandy" till (Drew and Daly, 1993). There is a notable linear sand/gravel body in the vicinity of New Inn.	
	<b>Thickness</b>	The data are clustered: in the northeastern part of the GWB the thickness ranges from 0-9 m, and in the western part the thickness is generally less than 3 m. The average thickness across the GWB is 3.5 m.	
	<b>% area aquifer near surface</b>	[Information to be added at a later date]	
	<b>Vulnerability</b>	[Information to be added at a later date]	
<b>Recharge</b>	<b>Main recharge mechanisms</b>	Both point and diffuse recharge occur in this GWB. Diffuse recharge is the dominant type and occurs via rainfall percolating through the subsoil and rock outcrops. Due to the low permeability of the aquifer and much of the subsoil ("clayey" till), a high proportion of the available recharge will discharge quickly to nearby streams. The stream density is relatively high (0.9 km/km <sup>2</sup> ), indicating a relatively high proportion of surface runoff. Point recharge occurs via the swallow holes but the proportion of recharge is small in comparison to the diffuse recharge.	
	<b>Est. recharge rates</b>	[Information to be added at a later date]	
<b>Discharge</b>	<b>Large springs and high yielding wells (m<sup>3</sup>/d)</b>	One reported 'Excellent' well in the GWB – Attymon (500 m <sup>3</sup> /d). This record is old GSI data.	

*1<sup>st</sup> Draft Loughrea GWB Description – July 2004*

	<p><b>Main discharge mechanisms</b></p> <p>The main groundwater discharges are to the streams, rivers and small springs.</p>
	<p><b>Hydrochemical Signature</b></p> <p>The following data are available for the Dinantian Upper Impure Limestones.</p> <p>Alkalinity (mg/l as CaCO<sub>3</sub>): 16 samples, range 244-408, median 322.</p> <p>Total Hardness (mg/l): 16 samples, range 256-440, median 326.</p> <p>Hydrogen sulphide is frequently reported in analyses. Iron can also present a problem: 14 sample, range 0-0.9 mg/l, median 0.08.</p> <p>The groundwater has calcium bicarbonate signature (CaHCO<sub>3</sub>), and is Hard. The other limestone units in the GWB are expected to have similar values for alkalinity and hardness. There are no data for electrical conductivity in this GWB, however it is expected to be similar to the national average for the Dinantian Pure, Impure Limestones of 690 µS/cm.</p>
	<p><b>Groundwater Flow Paths</b></p> <p>Generally, water levels are 0-10 m below ground level. Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. Flow paths are likely to be short - up to 300 m, with groundwater discharging rapidly to nearby streams and small springs. The proportion of groundwater taken by the swallow holes is expected to be low and is likely to be returned quickly to the surface network. Groundwater flow directions are expected to follow topography – overall to the west.</p>
	<p><b>Groundwater &amp; Surface water interactions</b></p> <p>Groundwater will discharge locally to streams and rivers crossing the aquifer and also to small springs and seeps. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater - surface water interactions occur. Baseflow to rivers and streams is likely to be relatively low.</p>
<b>Conceptual model</b>	<ul style="list-style-type: none"> <li>• The GWB occupies the area between Loughrea and Attymon. The northern, eastern and southern boundaries are surface water catchment divides, which includes the catchment divide between the Shannon and the Western RBD areas. The western boundary is the Dinantian Pure Bedded Limestones of the Clarinbridge GWB. Along the eastern boundary, there is a 1-3 km wide strip where the elevations range from 120-90 mAOD, with the land surface sloping west. The remainder of the land surface is characterised by relatively flat ground sloping to the west, with elevations ranging from 90-50 mAOD. Surface drainage is to the west.</li> <li>• The GWB is composed primarily of low transmissivity rocks. Most of the groundwater flux is likely to be in the uppermost part of the aquifer: comprising a broken and weathered zone typically less than 3m thick; a zone of interconnected fissuring typically less than 10m; and a zone of isolated fissuring typically less than 150m.</li> <li>• Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones.</li> <li>• Karstification is limited.</li> <li>• Recharge occurs diffusely through the subsoils and rock outcrops. Recharge is limited by the low permeability bedrock and in places by low permeability till, thus most of the available recharge discharges rapidly to nearby streams. A small proportion of point recharge occurs via the limited number of swallow holes present.</li> <li>• The groundwater has calcium bicarbonate signature (CaHCO<sub>3</sub>), and is Hard.</li> <li>• Flow paths are likely to be short – up to 300 m, with groundwater discharging rapidly to nearby streams and small springs and flow directions are expected to follow topography.</li> <li>• Overall flow direction is to the west.</li> </ul>
<b>Attachments</b>	Table 1. Figure 1.
<b>Instrumentation</b>	<p><b>Stream gauges:</b> 29016, 29017, 29070.</p> <p><b>EPA Water Level Monitoring boreholes:</b> None</p> <p><b>EPA Representative Monitoring points:</b> (GAL 092)</p>
<b>Information Sources</b>	<p>Daly, D. (1985) <i>Groundwater in County Galway with particular reference to its Protection from Pollution</i>. Geological Survey of Ireland report for Galway County Council. 98pp.</p> <p>Drew D.P. and Daly D. (1993) <i>Groundwater and Karstification in Mid-Galway, South Mayo and North Clare</i>. A Joint Report: Department of Geography, Trinity College Dublin and Groundwater Section, Geological Survey of Ireland. Geological Survey of Ireland Report Series 93/3 (Groundwater), 86 pp</p> <p>Gately, S., Sommerville, I., Morris, J.H., Sleeman, A.G. and Emo, G., 2003. <i>Geology of Galway-Offaly. A Geological description of Galway-Offaly, and adjacent parts of Westmeath, Tipperary, Laois, Clare and Roscommon to accompany the bedrock geology 1:100,000 scale map series, Sheet 15</i>.</p> <p>Pracht, M., Lees, A., Leake, B., Feely, M., Long, B., Morris, J., McConnell, B., (2003). <i>A geological description to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 14, Galway Bay</i>. Unpublished Geological Survey of Ireland Map Series Report.</p> <p>Geological Survey of Ireland. The Aquifer Chapters – unpublished.</p> <p>O’ Riain, G., (2004). <i>Water Dependent Ecosystems and Subtypes Draft Report</i>. WFD Support Projects. Compass Informatics in association with National Wildlife and Parks Service (DEHLG).</p>
<b>Disclaimer</b>	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae.

**Table 1. List of Rock units in the GWB**

<b>Rock unit name and code</b>	<b>Description</b>	<b>Rock unit group</b>	<b>Aquifer Classification</b>
Ballysteen Formation (BA)	Fossiliferous dark-grey muddy limestone	Dinantian Lower Impure Limestones	L1
Waulsortian Limestones (WA)	Massive unbedded lime-mudstone	Dinantian Pure Unbedded Limestones	L1
Lucan Formation (LU)	Dark limestone & shale ("Calp")	Dinantian Upper Impure Limestones	L1

**Loughrea GWB (For reference only)**

